



7002

COMMON -102

BOARD DIPLOMA EXAMINATION, (C-20)

FEBRUARY/MARCH —2022

DAE - FIRST YEAR (COMMON) EXAMINATION

ENGINEERING MATHEMATICS - I

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. If $A = \{-2, -1, 0, 1, 2\}$ and $f : A \rightarrow B$ is a function such that $f(x) = x^2 + x + 1$, then find the range of f .

2. Resolve $\frac{x}{(x-3)(x+2)}$ into partial fractions.

3. If $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 2 & 1 \\ 1 & 2 & 3 \end{pmatrix}$, then find $3B - 2A$.

4. Show that $\frac{\cos 36^\circ + \sin 36^\circ}{\cos 36^\circ - \sin 36^\circ} = \tan 81^\circ$.

5. Prove that $\frac{\sin 2\theta}{1 - \cos 2\theta} = \cot \theta$.

6. Find the real and imaginary parts of the complex number $(3 + 4i)(2 - 3i)$.

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7. Find the distance between the parallel lines $2x + 3y + 5 = 0$ and $2x + 3y + 9 = 0$.
 8. Evaluate $\lim_{x \rightarrow 3} \frac{x^3 - 27}{x - 3}$.
 9. Find the derivative of $x^3 + 6x^2 + 12x - 13$.
 10. If $y = 4x^2 - 8x + 2$, find $\frac{d^2y}{dx^2}$.

PART—B

8×5=40

Instructions : (1) Answer **all** questions.

(2) Each question carries **eight** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (a) Find the adjoint and inverse of the matrix $\begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}$.

(OR)

(b) Solve the system of linear equations

$3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$ using Cramer's rule.

12. (a) Prove that $\cos A + \cos(120 + A) + \cos(120 - A) = 0$.

(OR)

(b) Prove that $\tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) = \tan^{-1}\left(\frac{2}{9}\right)$.

13. (a) Solve $\cos \theta + \sin \theta = \sqrt{2}$.

(b) In any $\triangle ABC$, Show that $\sin A + \sin B + \sin C = \frac{s}{R}$.

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14. (a) Find the equation of the circle with (1,2) and (-2,3) as the two ends of its diameter and find its centre and radius.

(OR)

- (b) Find the equation of the conic whose focus is (1,-1), directrix is $x - y + 3 = 0$ and eccentricity is $1/2$.

15. (a) Find $\frac{dy}{dx}$, if $x^2 + y^2 + 2gx + 2fy + c = 0$, where g, f, c are constants.

(OR)

- (b) If $u(x, y, z) = \log(x + y + z)$, then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 1$.

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) Each question carries **ten** marks.

16. Find the lengths of the tangent, normal, sub-tangent and sub-normal for the curve $y = x^2 + 2x + 1$ at (1,4).

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